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The first specific heat measurements on artificially layered superconducting composite structures have been made. Small sample calorimetry has been used to measure the specific heat of Nb2r multilayers with a bi-layer period varying from 32 A to 429 A (to a sample thickness of 1.5 um) over the temperature range from 1.5 to 20. The normal state parameters agree with the presence of an interface of an Nb Zr alloy in agreement with earlier X-ray results. The behavior of the thermally measured transition into the superconducting state and the magnitude of the associated specific heat increase also agree with the Tri-layer model.

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SUPERCONDUCTING THIN FILMS, COMPOSITES AND JUNCTIONS

By

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G. L. Report 3722

April 1984

PUBLICATIONS

1. "The Science of Useful Superconductors - and Beyond," by T. H. Geballe, IEEE Trans. Mag. MAG-19, (1983).
2. "Phase Stability of Al₅ Nb-Sn," by F. Hellman, D. A. Rudman, R. H. Hammond and T. H. Geballe, Bull. Am. Phys. Soc., 28, 262 (1983).
3. "The Effect of Annealing on Sputtered Multilayers of NbZr," by P. R. Broussard, W. P. Lowe and T. H. Geballe, Bull. Am. Phys. Soc., 28, 298 (1983).
4. "Specific Heat of Thin Film Amorphous Molybdenum Based Alloys," by D. Mael, W. L. Carter, S. Yoshizumi and T. H. Geballe, Bull. Am. Phys. Soc., 13, 263 (1983).
5. "Annealing Effects on Superconductivity of Amorphous Vapor Quenched Mo_{1-x}Ge_x (x = 0.35)," by S. Yoshizumi and W. L. Carter, Bull. Am. Phys. Soc. 28, 263 (1983).
6. "Tunneling Properties of Zr:O_x as Artificial Barriers in Superconducting Tunneling Junctions," by S. Celaschi, R. H. Hammond, T. H. Geballe, W. P. Lowe and A. Green, Bull. Am. Phys. Soc. 28, 423 (1983).
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8. "NbZr Multilayers I: Structure and Superconductivity," W. P. Lowe and T. H. Geballe, submitted to Phys. Rev.
9. "NbZr Multilayers II: Extended X-ray Absorption Fine Structure Study," by T. Claeson, J. B. Boyce, W. P. Lowe and T. H. Geballe, submitted to Phys. Rev.
10. "Flux-Pinning and Inhomogeneities or Defects in Amorphous Superconducting Mo₅Ge₃ Films," by Shozo Yoshizumi, W. Carter and T. H. Geballe, to appear in the proceedings of the 5th International Conference on Liquid and Amorphous Metals, Los Angeles, (1983).
11. "Tunneling Properties of Single Crystal Nb/Nb₂O₅/Pb Josephson Junctions," by S. Celaschi, T. H. Geballe, and W. P. Lowe, Appl. Phys. Lett. 43, 794 (1983).

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12. "High Pressure Study of Some ThCu_2Si_2 -Type Ternary Compounds," by P. H. Hor, X. C. Jin, M. K. We, T. H. Lin and C. W. Chu, T. H. Geballe, G. W. Hull, Jr., J. H. Wernick, R. L. Meng and Z. X. Zhao, submitted to AIRAPT IX, 24-29, July 1983, Albany, N. Y.
13. "Superconductivity in Ternary Heusler Intermetallic Compounds," by J. H. Wernick, G. W. Hull, T. H. Geballe, J. E. Bernardini and J. V. Waszczak, Materials Letters, 2 90 (1983).
14. "Towards and Understanding of the Limits of Superconductivity," by T. H. Geballe presented at the Distinguished Lecture Series, New Mexico Institute for Mining, New Mexico, October 20, 1983.
15. "Materials: Analogue Answers in a Digital Age," by T. H. Geballe, submitted to Physica.
16. "New Possibilities for Niobium-Based Josephson Tunneling," by S. Celaschi, T. H. Geballe, and R. H. Hammond, submitted to Journal of Applied Physics.
17. "Further Investigations of Solid-Liquid Interaction and High Field Critical Current Density in Liquid-Infiltrated Nb-Sn Conductors," M. Hong, D. M. Maher, F. Hellman, T. H. Geballe, J. W. Ekin, and J. T. Holthuis, submitted to the Applied Superconductivity Conference, San Diego, September 1984.
18. "The Effect of Non-Hydrostatic Strain on the Superconducting Properties of In-Situ Formed Cu-Nb₃Sn Filamentary Composites," by J. Beuk, W. A. Sunder, F. Hellman, and T. H. Geballe, submitted to the Applied Superconductivity Conference, San Diego, September 1984.
19. "Origin of the B_{c2} Enhancement in Ternary Nb-Sn Phases," by R. Bormann, D. Y. Yu, R. H. Hammond, A. Marshall, and T. H. Geballe, submitted to the Applied Superconductivity Conference, San Diego, September 1984.
20. "Thin Film Growth of Stable Al₅ Compounds," by F. Hellman, T. H. Geballe, Bull. Am. Phys. Soc. 29, 385 (1984).
21. "The Metal-Insulator Transition in Amorphous Molybdenum-Germanium Alloys," by S. Yoshizumi, D. Mael, and T. H. Geballe, submitted to the International Conference on Heavy Doping and the Metal-Insulator Transition in Semiconductors, U.C. Santa Cruz, CA, 30 July - 3 August 1984.
22. "The Specific Heat of Niobium-Zirconium Multilayers," by P. R. Broussard, D. Mael and T. H. Geballe, Submitted to Physical Review.

VISITORS AND SEMINARS

1. Dr. M. Gurvitch, Bell Laboratories
"Boltzmann Transport and the Saturation of Electrical Resistivity"
October 6, 1983
2. Dr. Gloria Lubkin, Editor, Physics Today
"The Search for Stories: The Stories for Search"
October 26, 1983
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October 27, 1983
4. Dr. Gerd Binnig, IBM Zurich Research Laboratory
"Scanning Tunneling Microscopy, an Atomic Surface Probe"
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"Elementary Particle at Rest in Space: g -Factors and Structure of E^-/E^+ "
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6. Dr. Zachary Fisk, Los Alamos National Laboratory
"Uranium Based Electronic Analogs of $^3\text{Helium}(?)$ "
November 22, 1983
7. Professor Sidney Drell, Deputy Director SLAC
"Nuclear Weapons: Defense vs. Deterrets"
November 30, 1983
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"Microstructure of Random Solid Solutions: EXAFS Studies"
December 8, 1983
9. Dr. Richard Koyama, Tektronix Inc. Beaverton, Oregon
January 5, 1984
10. Dr. Clyde Kimball, Northeastern University
January 5, 1984
11. Professor Rudolf Peierls, Oxford University, ENGLAND
"Momentum and Pseudo-Momentum"
January 17, 1984
12. Dr. Gordon C. Osbourn, Sandia Laboratories
"Strained Layer Semiconductors"
January 26, 1984
13. Professor M. Brian Maple, University of San Diego
"Superconductivity, Magnetism and a Possible New Superconducting State"
January 11, 1984

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14. Dr. F. DiSalvo, Bell Laboratories
"Non-Linear Charge Density Wave Properties of Potassium
Molybdenum Bronze ($K_{0.3}MoO_3$)"
February 2, 1984
15. Dr. Bernardo Huberman, Xerox PARC
"Dynamics of Computing Structures"
February 15, 1984
16. Dr. John Rowell, Bell Laboratories
February 12-23, 1984
17. Dr. Jene Golovchenko, AT&T Bell Laboratories
"X-ray Wave Optics at 1 Å"
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New Discoveries, Inventions or Patent Disclosures

NONE

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1 October 1983 - 31 March 1984

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Broussard, Phillip	Ph.D. expected Summer 1985
Park, Sung	Ph.D. expected Summer 1986
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